

Determinants of functional limitations in basic and instrumental daily activities among older adults living in rural settings: a cross-sectional study

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Responsible Editor: Ferry Efendi

Received: 5 December 2025 ◦ Revised: 12 February 2026 ◦ Accepted: 25 February 2026

ABSTRACT

Introduction: Maintaining the functional capacity of older adults is essential to support independence, particularly in rural areas. Understanding the factors contributing to the reduced ability to perform activities of daily living (ADLs) and instrumental activities of daily living (IADLs) is essential for developing effective gerontological nursing strategies. This study identified the predictors of ADL and IADL impairment among older adults residing in rural communities.

Methods: This cross-sectional study involved 318 older adults selected through simple random sampling. The Barthel Index and Lawton IADL Scale were used to measure ADL and IADL abilities. The Geriatric Depression Scale was used to assess depressive symptoms, whereas difficulties in vision, hearing, and communication were evaluated using the Washington Group Short Set. Chi-square tests and logistic regression were used to examine the associations and predictors.

Results: ADL and IADL disabilities were identified in 4.4% and 10.1% of the respondents, respectively. Communication difficulties were a strong predictor of both ADL and IADL disabilities (AOR = 13.72; 95% CI = 3.26–57.76, $p < 0.001$ and AOR = 7.07; 95% CI = 2.34–21.34, $p < 0.001$). Depressive symptoms increased the risk of ADL disability (AOR = 4.17; 95% CI = 1.24–14.05, $p = 0.021$), and adults aged ≥ 75 years showed higher odds of IADL impairment (AOR = 4.39; 95% CI = 1.89–10.16, $p < 0.001$).

Conclusions: Challenges in communication and depressive affect functional capacity among rural older adults. Maintaining independence and improving daily functioning by implementing early identification and intervention targeting communication and mental health are essential.

Keywords: community engagement, community vulnerability assessment, disability policy, inclusive community

Introduction

Population aging is accelerating globally, including in Indonesia. As individuals age, they commonly experience physical, cognitive, and social changes that can progressively diminish their ability to manage everyday tasks independently (Saez-Sanz *et al.*, 2025). Limitations in activities of daily living (ADL) and instrumental activities of daily living (IADL) are major indicators of decline and are strongly associated with increased dependency, institutionalization, and mortality (Zhao *et al.*, 2022a). In the ASEAN region, the prevalence of ADL and IADL impairments was 21.5% and 46.8%, respectively (Yau *et al.*, 2022).

Indonesia has entered the aging society phase, as the older population now accounts for more than 12% of the national demographic profile (BPS-Statistics Indonesia, 2024). The majority of older individuals live in rural areas, where access to health services, rehabilitation programs, and age-friendly infrastructure remains restricted (Absor *et al.*, 2024). Previous studies have identified factors contributing to functional decline among older adults in Indonesia, such as sensory impairments, chronic diseases, and depressive symptoms (Handajani *et al.*, 2022, Suyasa *et al.*, 2023). These factors can hinder independence and pose major challenges for both families and the healthcare system.

Despite government initiatives, such as Health Integrated Post for older adults (*Posyandu Lansia*) and



other community-based programs targeted at promoting healthy aging (Asian Development Bank, [2021](#), Trisfayeti and Idris, [2022](#)), functional restrictions remain extensive, particularly in rural areas. Barriers, including insufficient health information, limited social interaction, and gaps in service accessibility, continue to limit older adults' functional well-being (Margaretha et al., [2021](#); Wenang et al., [2021](#); Ekadinata et al., [2023](#)). There is still limited empirical evidence specifically examining psychosocial and sensory determinants of ADL and IADL impairment in rural Indonesian populations.

From a psychosocial perspective, functional decline results from interactions between individual health conditions and social circumstances. Sensory and communication impairments may contribute to disability directly and indirectly through depressive symptoms, loneliness, and reduced participation in community activities (Shukla et al., [2019](#), Mercan et al., [2021](#), Prieur Chaintre et al., [2024](#)). Understanding these interconnected factors is essential for developing targeted community nursing interventions.

We hypothesized that increasing age, female sex, depressive symptoms, living alone, sensory impairment, and communication impairments would be independently associated with a higher odd of both ADL and IADL impairment among older adults. The study area was Bali, which was chosen because of its strong community structures, distinctive cultural norms, and longstanding traditions of intergenerational caregiving (Lestari et al., [2023](#)). This study aimed to identify the predictors of ADL and IADL impairment among older adults residing in a rural community.

Materials and Methods

Research design

A cross-sectional analytical approach was utilized to explore how sociodemographic characteristics, the condition of psychological and sensory or communication issues, relate to functional restrictions in older adults. This design allowed the examination of associations among variables at a single point in time.

Setting and Time Frame

Data were collected in a rural community in Bali between August and November 2024. The village was selected based on the following criteria: limited access to health facilities, a predominantly agrarian lifestyle, and a notable proportion of older residents living in extended family households (BPS-Statistics Gianyar Regency, [2025](#)).

Population, Samples, and Sampling

In total, there were 1,118 individuals in all residents aged 60 years and older living in the selected village in this study. Eligible participants were permanent residents who were able to participate in the interview.

Critically ill or hospitalized individuals were excluded during data collection. Daniel's formula with finite population adjustment was used to calculate the minimum sample size (Daniel and Cross, [2018](#)). The calculation assumed a 95% confidence level, a precision of 5%, and a conservative estimated prevalence of functional impairment of 50% to maximize sample size, resulting in a requirement of 287 respondents. We also ensured sufficient statistical power for the logistic regression analysis by using the events-per-variable principle, with a minimum of 10 outcome events per independent variable included in the model (Zabor et al., [2022](#)). Given the number of predictors in the regression model, the calculated minimum sample size met the recommended events-per-variable criteria. An additional 20% was added to the minimum sample size to account for potential non-response, incomplete data, or participant withdrawal, based on previous community-based surveys among older adults in similar rural settings (Farid et al., [2024](#)). Therefore, 340 individuals were selected through simple random sampling from the sampling frame generated from the updated village population registry of older adults. Each eligible individual was assigned a unique identification number, and participants were randomly selected using a computer-generated random number sequence. Of the 340 individuals in the sampling frame, 318 participants completed the survey, with a 93.5% response rate.

Instruments

Functional Status

The Barthel Index evaluates basic functional ability and ADL (Collin et al., [1988](#)). Respondents with ADL limitations were indicated by scoring 11 or below. The Lawton IADL Scale was used to assess instrumental activities (Lawton and Brody, [1969](#)), with a score of two or below indicating IADL disability. We used the validated Indonesian versions of both instruments. The Indonesian adaptations of the Barthel Index and the Lawton IADL Scale, including the cut-off points, have been used in a previous study involving Indonesian older adults (Suyasa et al., [2023](#)). In the present study, internal consistency reliability was assessed, yielding a Cronbach's alpha of 0.87 for the Barthel Index and 0.71 for the Lawton IADL Scale.

Depressive Symptoms

Emotional well-being was gauged using the five-item Geriatric Depression Scale (Hoyle et al., [1999](#)). Depressive symptoms were indicated if the participants scored two or higher.

Sensory and Communication Difficulties

Items adapted from the Washington Group Short Set were used to identify visual problems, hearing loss, and communication challenges (Washington Group on

Disability Statistics, [2020](#)). Respondents who chose “Yes – a lot of difficulty” or “Cannot do at all” were classified as having the corresponding impairment.

All instruments reflected respondents’ current health and functional conditions. These tools have been previously validated, applied, and widely utilized within the Indonesian population (Kementerian Kesehatan RI, [2017](#), Asian Development Bank, [2024](#)).

Data Collection

Data were obtained through structured face-to-face interviews conducted by trained enumerators. Training included orientation on proper communication with older adults, research ethics, and standardized administration of assessment tools. Proxy assistance by family members was permitted only when respondents had minor comprehension difficulties due to language or memory difficulties but were still able to provide primary responses. Family members were allowed to clarify questions or assist with recall. To minimize proxy-related bias, enumerators followed a standardized script and avoided leading questions. Full proxy substitution, in which family members answered on behalf of respondents, was not permitted. Participants unable to meaningfully participate in the interview were excluded from the study.

Data Analysis

SPSS version 27 was used for data analysis. Descriptive statistics were used to summarize participant characteristics. Bivariate associations were analyzed using the chi-square or Fisher’s exact tests, depending on cell counts. Variables with a p-value < 0.25 in bivariate analysis were entered into logistic regression models to determine independent predictors of ADL and IADL disability (Bursac *et al.*, [2008](#)), which recommends a more liberal threshold to avoid excluding potentially important confounders. Separate multivariable logistic regression models were constructed for ADL and IADL disabilities. All selected variables were entered simultaneously using the enter method to estimate adjusted odds ratios (AORs) and 95% confidence intervals (CIs). Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test. Multicollinearity was evaluated using variance inflation factors and tolerance values prior to model estimation. A VIF > 10 or tolerance < 0.1 was considered indicative of problematic multicollinearity. Given the relatively low prevalence of ADL disability (4.4%), the number of predictors included in the ADL model was restricted to ensure compliance with the events-per-variable (EPV) principle. This approach was implemented to reduce the risk of overfitting and model instability.

Ethical Consideration

The study protocol was approved by the Research Ethics Committee of the Institute of Technology and

Health Bali (Approval No. 04.0267/KEPITEKES-BALI/VII/2024). Participation in the study was completely optional, and all participants provided informed consent, and their personal data were kept confidential throughout the research.

Results

Participants Characteristics

Of the 318 respondents, most were between 60 and 74 years of age (67.0%). Women represented the majority (69.2%), and nearly all participants lived within a family household ([Table 1](#)).

Functional Status in ADL and IADL

Overall, older adults demonstrated independence in basic daily tasks. The highest functional abilities were observed in feeding, grooming, and general mobility. In contrast, higher dependence was noted for bowel control (24.8%) and stair climbing (13.2%). Based on the Barthel Index classification, 4.4% of respondents were classified as having ADL disability. Regarding instrumental tasks, 10.1% of participants had IADL restrictions according to the Lawton Scale. Tasks requiring complex cognitive or social engagement caused the highest dependency: 64.8% were unable to use the telephone, 74.9% required help with food preparation, and 77.1% were dependent for shopping. In contrast, most respondents remained independent in medication use (85.5%) and financial management (75.1%).

Depressive Symptoms and Sensory Impairments

Responses to the GDS-5 showed that 15.1% of older adults were depressed. Sensory impairments were also common; 27.7% reported visual difficulties, 20.1% experienced hearing problems, and 7.5% faced communication-related challenges.

Bivariate Analyses

The relationships between potential predictors and functional disability were examined using chi-square and Fisher’s exact tests. Depression demonstrated considerable relationships with both ADL ($p = 0.002$) and IADL ($p = 0.016$) disabilities. Communication problems were also strongly associated with ADL and IADL limitations (both $p < 0.001$). Age showed a notable association with IADL impairment ($p < 0.001$), indicating that older respondents (≥ 75 years) were more frequently dependent on performing instrumental tasks. Meanwhile, sex, visual impairment, living arrangements, and hearing impairment did not show statistically significant associations with ADL or IADL disabilities ($p > 0.05$).

Multivariate (Logistic Regression) Analysis

Logistic regression was used to identify independent predictors of functional disability in both ADL and IADL.

Four variables (age, depressive symptoms, hearing impairment, and communication difficulties) were included in the model based on bivariate screening (Table 2).

ADL Disability

The model showed a significant overall fit, $\chi^2(4, N = 318) = 25.37, p < 0.001$, explaining between 7.7% (Cox & Snell R^2) and 25.3% (Nagelkerke R^2) of the variance, with a classification accuracy of 95%. The Hosmer–Lemeshow goodness-of-fit test indicated an adequate model fit ($p = 0.437$). Collinearity statistics indicated variance inflation factor values between 1.048 and 1.200, with tolerances of 0.834 and 0.954. Two variables appeared as significant predictors: communication difficulties were the strongest determinant of ADL disability (AOR = 13.72; 95% CI = 3.26–57.76; $p < 0.001$), and depressive symptoms increased the likelihood of ADL limitations (AOR = 4.17; 95% CI = 1.24–14.05; $p = 0.021$).

IADL Disability

The model for IADL disability was also significant, $\chi^2(4, N = 318) = 38.59, p < 0.001$, accounting for 11.4% to 23.8% of the variance (Cox & Snell and Nagelkerke R^2 , respectively), with an 89% correct classification rate. The Hosmer–Lemeshow goodness-of-fit test indicated adequate model fit ($p = 0.478$). Collinearity statistics indicated variance inflation factor values between 1.048 and 1.200, with tolerances of 0.834 and 0.954. Two variables were significant predictors: communication difficulties (AOR = 7.07; 95% CI = 2.34–21.34; $p < 0.001$) and age ≥ 75 years (AOR = 4.39; 95% CI = 1.89–10.16; $p < 0.001$).

Discussions

This study identified the determinants of functional disability in both ADLs and IADLs among older adults living in rural areas, revealing the substantial influence of communication problems, advanced age, and depressive symptoms. These findings underscore the interconnectedness of sensory, psychosocial, and functional domains in later life and add new insights to the limited body of evidence from rural Indonesian settings.

A prominent finding of this study is the strong association between communication problems and functional impairments. Older adults with communication problems were almost 14 times more likely to have ADL limitations and seven times more likely to experience IADL disability. This highlights the central role of communication in sustaining overall functioning. Effective communication is pivotal for maintaining social relationships, expressing needs, obtaining information, and engaging in health-seeking behaviors (Manchha *et al.*, 2025). When communication is constrained, whether due to speech challenges, hearing deficits, cognitive

decline, or other factors, individuals may avoid social interactions, leading to isolation and reduced participation in meaningful activities. These pathways align with earlier findings showing that communication impairments can predict increased fall risk, declines in cognitive functioning, and worsening disability (Koszalinski and Olmos, 2022, Zhou *et al.*, 2024). The present results further support theoretical perspectives that communication restrictions negatively influence functioning by reducing social engagement, increasing psychological stress, and limiting access to supportive resources (Merican *et al.*, 2021, Prieur Chaintre *et al.*, 2024). The influence of communication is more pronounced in rural areas, where limited access to formal support services and greater reliance on social support play important roles in daily life.

Depressive symptoms were also identified as an important predictor of ADL impairment. Older adults experiencing depressive tendencies were more than four times as likely to report limitations in basic daily tasks. This finding aligns with previous work indicating that depression is significantly associated with older adults' ability to function independently (Feng *et al.*, 2021, Peng *et al.*, 2021, Yan *et al.*, 2023). Individuals with depressive symptoms often experience impaired concentration, reduced energy, hopelessness, and a lowered interest in daily activities, all of which can hinder physical functioning and accelerate disability progression (Buss *et al.*, 2022, Berk *et al.*, 2023). Prior research has shown that depression can heighten the risk of functional impairment by up to sixfold (Zhao *et al.*, 2022b). The present study supports the importance of integrating routine mental health screening into community-based gerontic nursing care and highlights the need for early psychosocial interventions.

Age is another significant determinant, particularly for IADL disability. Respondents aged ≥ 75 years were more than four times as likely to have restrictions in performing instrumental tasks than younger respondents. This pattern reflects established evidence that physiological aging leads to gradual declines in neuromuscular performance, sensory perception, and cognitive function (Wu *et al.*, 2021). IADLs, which involve decision-making, planning, and complex task execution, such as managing finances, shopping, and preparing meals, are typically the first areas affected. Consequently, reductions in IADL abilities can be early indicators of potential loss of independence in basic ADLs. This finding highlights the need for preventive strategies targeting wellness, strength maintenance, and cognitive stimulation in older age groups.

Interestingly, although sensory impairments, such as hearing and visual difficulties, were relatively common among respondents, they were not significant predictors of disability in the multivariate analysis. One plausible explanation is the strong collectivist culture and

intergenerational caregiving traditions in Bali, where family members provide significant support to older adults (Lestari *et al.*, 2023, Rahsyani and Purwati, 2024). These cultural practices may alleviate the functional effects of sensory loss by providing support that offsets difficulties in mobility, communication, and daily tasks. Comparable results have been reported in other Indonesian studies, showing that extended family networks help reduce the functional burden of sensory impairments (Widagdo *et al.*, 2025). Measurement limitations may also have played a role. In this study, we measured impairment using self-reported rather than objective clinical assessments, which may have reduced the sensitivity in detecting associations. These contextual and methodological factors should be considered when interpreting the findings.

The findings of this study have multiple implications for community health programs and nursing practice. Geriatric assessments should be integrated with routine screening for communication problems and depressive symptoms, especially in primary care and community-based services. Developing interventions tailored to the social and cultural characteristics of rural older adults may help sustain functional independence. These may include community engagement programs, communication-enhancing interventions, and mental health promotion activities. Additionally, reinforcing existing community health initiatives, such as *Posyandu Lansia* through multidisciplinary collaboration among community health workers, nurses, and family caregivers may support a more holistic approach to aging.

Although this study has certain limitations, it also makes important contributions. First, the cross-sectional nature of the research limits the ability to draw conclusions about causality among depressive symptoms, age, communication difficulties, functional limitations, and hearing impairments. Future longitudinal studies could provide more insight into how these factors interact over time. Second, the reliance on self-reported data introduces the potential for socially desirable responses or recall bias, particularly among older adults with difficulties in memory or restricted health literacy. Third, the study may limit the generalizability of findings to older adults in different cultural or socioeconomic contexts because it was conducted in one rural community in Bali. The applicability of the results may improve with various multi-site studies conducted in various regions. Lastly, the study did not involve important variables such as medication use, coexisting chronic illnesses, nutritional status, or cognitive function, all of which might contribute to functional outcomes. Incorporating these factors in future analyses would deliver a more comprehensive understanding of the determinants of functional disability among older adults.

Conclusion

This study demonstrates that communication difficulties are the most influential predictors of functional impairments in both ADLs and IADLs among older adults residing in rural Bali. Depressive symptoms further contribute to restrictions in basic daily activities, whereas advanced age plays an important role in the decline in instrumental abilities. These findings emphasize the need for community-based geriatric nursing interventions to incorporate routine screening for communication impairments and depressive symptoms as part of regular health assessments at primary care and *Posyandu Lansia* services. Nurses should implement targeted interventions, such as communication support strategies, referrals for hearing or sensory evaluations, structured mental health screening, and community engagement programs, to strengthen social participation. Home visits and family education should also be prioritized to enhance support systems for older adults at risk of functional decline.

Acknowledgments

This study was supported by the Institute of Technology and Health Bali. The authors declare that the funding body had no involvement in the study design, data collection procedures, data analysis, interpretation of findings, or the decision to publish the manuscript.

The authors acknowledge that artificial intelligence tools were used to prepare this manuscript. Specifically, ChatGPT (OpenAI, GPT-5 model) helped enhance wording, refine the academic tone, and translate selected sentences from Indonesian to English. The authors interpreted all the content, generated the conclusions, reviewed, and verified independently to ensure accuracy and academic integrity. The conceptualization, methodology, analysis, or reporting of study results were performed without AI influence, and this work represents the authors original scholarship.

Funding source

This research was fully funded by the Institute of Technology and Health Bali. The institution did not influence any aspect of the study or manuscript preparation.

Availability of data and materials

Owing to ethical restrictions and participant confidentiality, the datasets generated and analyzed in this study are not publicly available. Data may be accessed through the corresponding author upon reasonable request and with permission from the ethics committee.

Authors' contributions

First author: Study conception and design; study supervision; critical revisions for important intellectual content; manuscript writing. Second author: Study conception and design; study supervision; essential revisions for important intellectual content, manuscript writing. Third author: Data collection; manuscript writing; references.

Declaration of Interest

All authors have no conflict of interest related to this study.

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How to cite this article: Suyasa, I.G. P. D., Agustini, N. L. P. I. B., and Sutini, N. K. (2026) 'Determinants of functional limitations in basic and instrumental daily activities among older adults living in rural settings: a cross-sectional study', *Jurnal Ners*, 21(1), pp. 95-102. doi: <http://dx.doi.org/10.20473/jn.v21i1.83252>

Table 1. Bivariate analyses of Disability in ADLs and IADLs among older people living in Bali, Indonesia (n=318)

Variable	Categories	Disability in ADLs				Disability in IADLs					
		Yes n (%)	No n (%)	Overall n (%)	p-value	Effect size (φ)	Yes n (%)	No n (%)	Overall n (%)	p-value	Effect size (φ)
Age	60-74	7 (2.2)	206 (64.8)	213 (67.0)	0.243 [‡]	-0.077	10 (3.1)	203 (63.8)	213 (67.0)	<0.001 [§]	-0.254
	75+	7 (2.2)	98 (30.8)	105 (33.0)			22 (6.9)	83 (26.1)	105 (33.0)		
Gender	Male	5 (1.6)	93 (29.2)	98 (30.8)	0.768 [‡]	0.685	12 (3.8)	86 (27.0)	98 (30.8)	0.508 [§]	0.048
	Female	9 (2.8)	211 (66.4)	220 (69.2)			20 (6.3)	200 (62.9)	220 (69.2)		
Living alone	Yes	0 (0.0)	7 (2.2)	7 (2.2)	1.000 [‡]	0.032	0 (0.0)	7 (2.2)	7 (2.2)	1.000 [‡]	0.050
	No	14 (4.4)	297 (93.4)	311 (97.8)			32 (10.1)	279 (87.7)	311 (97.8)		
Depression	Yes	7 (2.2)	41 (12.9)	48 (15.1)	0.002[‡]	-0.209	10 (3.1)	38 (11.9)	48 (15.1)	0.016[‡]	-0.151
	No	7 (2.2)	263 (82.7)	270 (84.9)			22 (6.9)	248 (78.0)	270 (84.9)		
Vision loss	Yes	2 (0.6)	86 (27.0)	88 (27.7)	0.364 [‡]	0.064	10 (3.1)	78 (24.5)	88 (27.7)	0.788 [§]	-0.027
	No	12 (3.8)	218 (68.6)	230 (72.3)			22 (6.9)	208 (65.4)	230 (72.3)		
Hearing impairment	Yes	5 (1.6)	59 (18.6)	64 (20.1)	0.168 [‡]	-0.083	12 (3.8)	52 (16.4)	64 (20.1)	0.019[§]	-0.145
	No	9 (2.8)	245 (77.0)	254 (79.9)			20 (6.3)	234 (73.6)	254 (79.9)		
Communication problems	Yes	7 (2.2)	17 (5.3)	24 (7.5)	< 0.001[‡]	-0.345	11 (3.5)	13 (4.1)	24 (7.5)	< 0.001[‡]	-0.340
	No	7 (2.2)	287 (90.3)	294 (92.5)			21 (6.6)	273 (85.8)	294 (92.5)		

§ Chi-square test; ‡ Fisher's exact test

Table 2. Logistic regression determinant factors of functional disability in ADLs and IADLs among older people living in Bali, Indonesia (n=318)

	ADL							IADL								
	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper							Lower	Upper
Age	0.335	0.621	0.291	1	0.590	1.398	0.414	4.723	1.480	0.428	11.971	1	<0.001	4.392	1.899	10.157
Depression	1.427	0.620	5.291	1	0.021	4.166	1.235	14.052	0.775	0.467	2.753	1	0.097	2.171	0.869	5.425
Hearing impairment	-0.330	0.758	0.190	1	0.663	0.719	0.163	3.173	0.034	0.509	0.004	1	0.947	1.035	0.381	2.807
Communication problems	2.619	0.733	12.752	1	< 0.001	13.721	3.259	57.760	1.956	0.564	12.031	1	< 0.001	7.068	2.341	21.339
Constant	0.070	0.681	0.011	1	0.918	1.073	NA	NA	-0.853	0.564	2.293	1	0.130	0.426	NA	NA

NA=Not applicable